

**Proposal for M.S. with a major in Information Systems****Description of Program****Program Overview**

The departments of Computer Science and Information Systems and Technology propose to offer a Master of Science Degree with a major in Information Systems. This program includes a unique combination of elements related to software engineering, project management, and computer science. The program emphasizes both the technical and business aspects of information technology. It takes advantage of the strengths of our faculty in software engineering, strategy and leadership, human computer interaction, consulting, and IT infrastructure. The participation of the Information Technology Office will give students the benefit of real-world experience in the leadership an IT organization.

Information technology is a core part of almost all modern enterprises. The IT infrastructure of an enterprise includes hardware such as PCs, servers, networks, data storage facilities and software systems such as ERP (Enterprise Resource Planning), CRM (Customer Relationship Management), knowledge management systems, security systems, and e-mail. The student will learn to understand the IT infrastructure and how to manage it.

When upgrades or additions to the IT infrastructure are needed, there is a choice of whether to build in-house, to build by outsourcing, to buy commercial off the shelf products and run in-house, or to use a service provider. These decisions now are made in the context of a global IT marketplace of software products, services, and employment. The student will learn how to choose the best solution approach to fulfill IT infrastructure needs.

The first step of addressing IT need is to document the requirements for the upgrade or addition. Next, IT managers must plan and then manage IT projects. Because IT projects historically had a high failure rate, and successful projects often run over budget, over schedule, or both, it is important for the manager to understand how IT systems are constructed, even if the construction of the system is contracted or the system is purchased. In each of these cases, the IT system must be tested and its quality must be assessed. The quality of software includes not only its correctness and reliability, but also ease and efficiency of use, maintenance and upgrade cost, and extendibility to future needs.

IT is an integral part of the strategy of an enterprise. In the past, IT has often consisted of a number of separate systems; the current trend is to integrate these separate systems into a powerful, integrated enterprise system. Many businesses have used powerful and adaptive IT infrastructure to obtain competitive advantage. The "Strategy and Leadership" course covers these aspects of IT.

The proposed program is derived from on the MSIS 2000 Curriculum Recommendations<sup>1</sup> and the MSIS 2006 Curriculum Preview<sup>2</sup>. Both the prerequisites and the core courses correspond to those courses recommended by MSIS 2006, with a few exceptions to capitalize on the strengths of our faculty.

This program will prepare students to be systems analysts and IT managers in the field of Information Technology (IT). Often, the competitive advantage of US workers in the global IT marketplace is their knowledge of the business and their ability to communicate technical issues on a personal level with the users of IT. The program will emphasize technical knowledge, business concepts, and communication skills throughout, and there will be an emphasis on those aspects of IT where US workers are competitive in the global marketplace. Graduates of the program should be able to participate in and manage many different kinds of IT projects, working effectively with technical staff, users, and management. With additional experience, graduates will progress toward positions as CIO (Chief Information Officer) of an organization.

A unique aspect of this program will be that students will have the opportunity to participate in a team cross-cultural software development project. In the course "Globalization and Outsourcing," students will participate in a project that is coordinated across two campuses, one at UM and one overseas. This will give students a sound appreciation for the cross-cultural and technical problems associated with such a project, and with offshored outsourcing projects in general.

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<sup>1</sup> MSIS 2000 Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems, John T. Gorgone, et al., Communications of the Association for Information Systems, Vol. 3, Article 1, January 2000. <http://www.cudenver.edu/.../msis2000model.pdf>

<sup>2</sup> MSIS 2006 Curriculum Preview, John T. Gorgone, et al, Communications of the Association for Information Systems, Vol. 15, Article 30, April 2005. <http://facweb.cs.depaul.edu/aburns/is435/MSIS2006.pdf>

**Audience**

The program is oriented toward students who have an undergraduate major in either computer science or in information systems. The program includes the basic courses in both undergraduate programs as prerequisites. The program also requires as prerequisites courses in areas of database, software engineering, and computer networking. Students with undergraduate majors in other areas will be able to complete the program by taking additional prerequisites. All of the prerequisites are offered at many institutions, including online universities, and do not have to be taken at the University of Montana.

The program will appeal to people working toward or currently working in commercial IT positions who want to broaden and deepen their IT knowledge. Organizations will continue to increase their IT needs and demands in the coming years. This program will produce graduates ready to meet these needs.

**Detailed Description of Program**

**Prerequisites** Equivalent courses can be taken at other institutions or online.

**Basic CS prerequisites:**

CS 131	Fundamentals of Computer Science I
CS 132	Fundamentals of Computer Science II
MATH 225	Discrete Math
CS 241	Data Structures

**Basic Business prerequisites:**

ACCT 201	Financial Accounting or (ACCT 509 Financial Reporting & Control)
FIN 322	Business Finance (or FIN 522 Principles of Financial Analysis)
MKTG 360	Marketing Principles (or MGMT 340 Mgmt. and Org. Behavior)
IS 341	Operations Management

**More advanced courses:**

IS 370 or CS 365	Database
IS 372 or CS 388	Telecommunications/networks
IS 373 or CS 346	Systems Analysis and Design/Software Engineering

**Program Requirements****Credits****Computer Science Core****15**

CS 565 Database Systems
CS 511 Analysis, Modeling, and Design (new course, 3 credits)
CS 512 Software Quality Assurance (new course, 3 credits)
CS 521 IT Infrastructure (new course, 3 credits)
CS 522 Globalization and Outsourcing (new course, 3 credits)

**Information Systems Core****10**

IS 571 Enterprise Modeling (new course, 2 credits)
IS 572 Strategy and Leadership (new course, 2 credits)
IS 573 Business Process and Security (new course, 2 credits)
IS 574 Management of Information Systems (new course, 2 credits)
IS 575 Introduction to Consulting (new course, 2 credits)

**Computer Science Electives****6**

CS 576 Human Computer Interface
CS 435 Web Programming
CS 415 Computer Ethics
CS 455 Artificial Intelligence
CS 477 Machine Learning

**Information Systems Electives****5**

IS 471 Fundamentals of Network Management
IS 472 Advanced Network Management
IS 475 Advanced Technology Support
IS 476 Project Management

IS 477 Multimedia Development for Business  
 IS 478 Development of E-Commerce Systems  
 IS 495 Special Topics  
 MBA 655 International Entrepreneurship and High Tech Legal Issues (1 credit)  
 MBA 655 Marketing of High Tech Products (2 credits)

**Total**

**36**

### **Rationale for Program**

A number of similar degrees are available around the country, although no universities in Montana currently offer an M.S. in Information Systems. We think our program will reach a steady state of 35 students within five years.

We have contacted people from five Master of Science in Information Systems programs. They all have healthy enrollments, as shown by the following table:

<b>School</b>	<b>Active Students</b>
Oklahoma State	70 to 80
Baylor	29
University of Colorado at Denver	50
Boise State University	30
Central Michigan	40 to 60

Contacts all said that enrollments were about double the enrollments before 2001, and that they were experiencing a small up-tick in enrollments this year. We anticipate reaching an enrollment of 35 students within five years.

According to the Bureau of Labor Statistics<sup>3</sup>, administrative jobs in technology fields are among the fastest growing and highest paying jobs in the nation and are projected to continue to flourish over the next ten years. Employment for computer and information systems managers is estimated to increase 36% over the period 2002 to 2012. The mean annual wage for this job classification is \$98,260. Other administrative career opportunities, such as database administrator and network administrator, also are expected to increase at a rapid rate.

A survey cited in the trade journal *CIO* indicates that 69% of the CIOs in the country are concerned that they will not be able to fill IT management jobs with qualified people in the next five to ten years.<sup>4</sup> As the gap increases between the number of IT management jobs and the number of qualified candidates, university programs positioned to prepare IT leaders will become even more attractive to potential students.

The program follows the prerequisite structure recommended by the MSIS 2006 Curriculum Preview<sup>2</sup> and includes most of the core courses recommended by MSIS 2006. The following core courses recommended by MSIS 2006 are included: "Enterprise Modeling," "Analysis, Modeling, and Design," and "IT Infrastructure." The recommended course, "Strategy and Policy" is replaced by "Strategy and Leadership." The recommended "Project and Change Management" is replaced by "IT Management," and the recommended "Integrated Capstone" is implemented as "Globalization and Outsourcing." MSIS recommends either "Implications of Digitization" or "Human Computer Interactions" as a core course. "Implications of Digitization" is implemented by "Business Processes and Security," which includes many of the same topics as the recommended course. "Human Computer Interface" is offered as an elective in the proposed program. In addition, the proposed program includes "Software Quality Assurance" as a core course. The program contains 6 credits of electives allowing students to broaden or deepen their skill sets.

Databases are core to almost all current uses of IT, and the "Database Systems" course will give students a sound theoretical and practical knowledge of databases. "Analysis, Modeling, and Design" shows students how a business problem is analyzed and described in preparation for the design of a software solution. Much of this analysis must be done even if software to solve the problem is purchased or development of the software is outsourced. "Software Quality Assurance" shows students how quality software can be produced. Again, even if software is purchased, it is important for the manager to know how the software can be tested to determine if it

<sup>3</sup> <http://www.bls.gov>

<sup>4</sup> <http://www2.cio.com/research/surveyreport.cfm?id=70>

will serve its intended purpose. Security threats to IT seem to be increasing in severity and frequency--the course "Business Processes and Security" covers this very important topic in IT. "IT Infrastructure" covers the hardware and software systems that make up an enterprise-computing environment. "Enterprise Modeling" covers the technical aspects of managing the IT environment, whereas "Management of Information Systems" considers the role of IT within the organization and the management of the day-to-day operations of the IT function. Most people with a career in IT will either be consultants or hire consultants at some time in their career, and "Introduction to Consulting" covers this topic. It also covers the interpersonal skills necessary for consulting. "Strategy and Leadership" will provide students with a clear understanding of how IT can influence an organization's strategy.

Outsourcing is defined as the management and/or day-to-day execution of an entire business function by a third party service provider.<sup>5</sup> Outsourcing has substantially changed the field of Information Technology (IT) in recent years. Many organizations are finding that it is more efficient outsource aspects of their IT operations to a company that specializes in that kind of IT. The improvement in communications technologies has made it possible to outsource many functions overseas where labor rates can be much lower than in the US. Computer programming is one function that often has been outsourced overseas, sometimes successfully and sometimes unsuccessfully. "Globalization and Outsourcing" relates to these topics.

**Start date:**

Required courses would be offered for the first time in the fall semester of 2007.

**Additional Courses:**

The following new courses are associated with this program.

Computer Science:		Credits
CS 511	Analysis, Modeling, and Design	3
CS 512	Software Quality Assurance	3
CS 521	IT Infrastructure	3
CS 522	Globalization and Outsourcing	3
Information Systems*:		
IS 571	Enterprise Modeling	2
IS 572	IT Strategy and Leadership	2
IS 573	Business Process and Security	2
IS 574	Management of Information Systems	2
IS 575	Introduction to Consulting	2

\* The Information Systems classes will also be used as electives in the MBA and MACCT programs.

**Adequacy of Current Resources:**

We are requesting one new faculty member and funds for graduate assistants (one in each department, beginning in Fall 2009). See the Cost Analysis section below.

The program will use online resources, including the existing library subscription to the ACM Digital Library. Additional library facilities are not needed.

**Accreditation Status:**

The Association to Advance Collegiate Schools of Business (AACSB) does not accredit programs in which the business school teaches fewer than 50% of the credit hours. In the proposed program, the Information Systems and Technology Department will teach 15 of the 36 required credits. In addition, the administration of the program is in the Computer Science Department, with an interdisciplinary advisory committee. Computer Science programs are not accredited at the graduate level.

**Assessment Plan:**

**Learning Outcomes:**

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<sup>5</sup><http://en.wikipedia.org/wiki/Outsourcing>, Sept. 13, 2005.

- M.S. in Information Systems graduates will possess a broad business background.
- M.S. in IS graduates will be competent in information technology.
- M.S. in IS graduates will understand contemporary issues surrounding the management of the enterprise's information resources.
- M.S. in IS graduates will exhibit interpersonal and team skills and will be able to communicate effectively in an oral and written manner.
- M.S. in IS graduates will think critically and analytically.

**Method of Assessment:**

The M.S. major in Information Systems program will be assessed using a portfolio approach. Examples of each student's work from each class will be maintained electronically. At the end of each year, a sample of portfolios will be evaluated by a committee that includes faculty from the Computer Science Department and the Information Systems and Technology Department. The committee will prepare a report for the existing advisory boards for both departments, and these boards will make recommendations for improvements to the program.

**Additional Faculty Requirements:**

An additional faculty member will be hired in the Information Systems and Technology Department. An additional faculty member will be hired in the Computer Science department in Fall 2008. The CS department will have primary responsibility for administration and advising for the program.

**Impact on Facilities:**

The existing facilities will not be adversely affected. Students will be required to purchase their own laptop computer, so additional pressure will not be placed on existing computer laboratories.

**Relationship to Other Institutions:**

To our knowledge, no other university in Montana has a similar program.

**Description of Proposal Development Process:**

An interdisciplinary committee met bi-monthly during the spring semester of 2005 to design the curriculum. Members of the committee were Alden Wright, Ray Ford, Belva Jones, Joel Henry, Jerry Evans, Lee Tangedahl, and David Firth. Committee members based the proposed program on a model curriculum endorsed by the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS). The program was approved by vote of the faculty of the two departments and the faculty of the School of Business Administration.